2008-07

N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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http://hdl.handle.net/2027.42/64943
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Research Design

Contributors
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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

**Causality**

A \[ \rightarrow \] B
Pressure \[ \rightarrow \] Ulcer

**Multicausality**

Years smoking → Heart disease
High fat diet → Heart disease
Limited exercise → Heart disease
Concepts Relevant to Research Design (2)

- **Probability:** Likelihood of an outcome
- **Bias:** Slanting findings
- **Manipulation:** Treatment
- **Control:** All phases of design
Design Validity

- **Measure of accuracy of a study**

- **Examined with critique of the following dimensions:**
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- Controlling the treatment
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- **Controlling extraneous variables**
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

- **Is there a treatment?**
  - No
  - **Is the primary purpose examination of relationships?**
    - No
    - **Descriptive Design**
    - Yes
    - **Quasi-Experimental Study**
  - Yes
  - **Is the treatment tightly controlled by the researcher?**
    - No
    - **Will the sample be studied as a single group?**
      - No
      - **Correlational Design**
      - Yes
    - Yes
    - **Will a randomly assigned control group be used**
      - No
      - **Is the original sample randomly selected?**
        - No
        - Yes
      - Yes
      - **Experimental Study**

Selecting a Descriptive Design

Examining sequences across time?

No

One Group?

No

Comparative Design

Descriptive Design

Yes

Following same subjects across time?

No

Data collected across time

Cross-sectional design

Studying events partitioned across time?

No

Trend Analysis

Yes

Repeated measures of each subject

Yes

Longitudinal Study

No

Single unit of study

Yes

Case Study

Research Design

Cross-sectional design with treatment partitioning

Longitudinal design with treatment partitioning
A Typical Descriptive Design

Clarification ➔ Measurement ➔ Description ➔ Interpretation

Phenomenon of Interest

Variable 1 ➔ Description of Variable 1
Variable 2 ➔ Description of Variable 2
Variable 3 ➔ Description of Variable 3
Variable 4 ➔ Description of Variable 4

Interpretation of Meaning
Development of Hypotheses
A Comparative Descriptive Design

Group I {variables measured} → Describe

Comparison of Groups on Selected Variables → Interpretation of Meaning

Group II {variables measured} → Describe

Development of Hypotheses
Selecting the Type of Correlational Design

Describe relationships between/among variables?
- Descriptive correlational design

Predict relationships between/among variables?
- Predictive correlational design

Test theoretically proposed Relationships?
- Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Development of Hypotheses

Research Variable 2

Description of variable
A Predictive Design

\[
\text{Value of Intercept} + \text{Value of Independent Variable 1} + \text{Value of Independent Variable 2} = \text{Predicted Value of Dependent Variable}
\]
Selecting The Type of Quasi-Experimental Design

- Control Group?
  - No
    - Pretest?
      - No
        - One-group post-test only design
      - Yes
        - Comparison with population values?
  - Yes
    - Repeated Measures?
      - No
        - Strategy for Comparison
      - Yes
        - Yes
          - Repeated Measures?
            - No
              - Suggest Reevaluating design
            - Yes
              - Compare treatment & control conditions?
Selecting The Type of Experimental Design

1. Pretest
   - No
     - Post-test only control group design
   - Yes
     - Repeated Measurements?
       - No
         - Examine effects of confounding variables?
           - No
             - Multiple sites?
               - Pretest/post-test control group design
               - Randomized clinical trials
             - Yes
               - Blocking?
                 - No
                   - Comparison of multiple levels of treatment
                     - Yes
                     - Randomized Block Design
                 - Yes
                   - Examination of complex relationships among variables in relation to treatment
                   - Yes
                     - Nested Designs
# Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Randomly selected control group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Measurement of dependent variables</strong></td>
<td><strong>Manipulation of independent variables</strong></td>
</tr>
<tr>
<td><strong>PRETEST</strong></td>
<td><strong>TREATMENT</strong></td>
</tr>
<tr>
<td><strong>POST-TEST</strong></td>
<td><strong>POST-TEST</strong></td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:**
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

**Example:** Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

**Uncontrolled threats to validity:**
- Testing
- Mortality

**Instrumentation:**
- Restricted generalizability as control increases
## Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Treatment:</th>
<th>Under control of researcher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Findings:</td>
<td>Comparison of experimental and control groups</td>
</tr>
<tr>
<td>Uncontrolled threats to validity:</td>
<td>Instrumentation Mortality Limited generalizability as control increases</td>
</tr>
</tbody>
</table>
### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>Unit A</th>
<th>Unit B</th>
<th>Unit C</th>
<th>Unit D</th>
<th>Unit E</th>
<th>Unit F</th>
<th>Unit G</th>
<th>Unit H</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRN Medication</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>New approach: “Around the clock” medication</td>
<td>Unit E</td>
<td>Unit F</td>
<td>Unit G</td>
<td>Unit H</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Primary Nursing Care**

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
</tr>
<tr>
<td>Unit E</td>
<td>Unit F</td>
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<tr>
<td>Unit G</td>
<td>Unit H</td>
</tr>
</tbody>
</table>
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically

- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design